As a material for varnish making, amber was a recognised commercial article in the sixteenth century. Whether it was the basis of the varnish used by the old violin makers has long been a disputed question, which can never be satisfactorily settled. It is not improbable that the peculiar electric qualities possessed by amber may have exercised some influence in producing the marvellous tones of the violins of the old masters; and the extremely dangerous and difficult task of melting amber in either fixed or volatile oils, on account of its liability to fire under heat, would preclude any attempt at its manufacture except in the laboratory and under personal superintendence, so that the secret of its preparation died with each master.

On the other hand, the danger and difficulty attending the melting of the substance has been advanced as a reason against the probability of its use. As a modern varnish material, amber is now scarcely in demand. With regard to English amber, though specimens are not unfrequently found on the Norfolk, Suffolk, and Essex coasts, as stated by Dr. Conwentz, there has been some doubt as to the genuine character of some of the pieces, which appear to have been copal or anime rather than true amber. The similarity in the formation of the two resins is borne out by an illustration of concentric structure given by Dr. Conwentz in his valuable paper before alluded to, with a specimen of Demerara copal from the locust tree (*Hymenæa Courbaril*) in the Kew Museum.

JOHN R. JACKSON.

THE RED DEER.

Fur and Feather Series: Red Deer. Natural History, by Rev. H. A. Macpherson; *Stalking*, by Cameron of Lochiel; *Hunting*, by Viscount Ebrington; *Cookery*, by A. I. Shand. Pp. viii + 320. 12mo, illustrated. (London: Longmans, Green, and Co., 1896.)

ALL contributions to the natural history of the finest of our British mammals cannot fail to be interesting to all with a zoological turn of mind; while accounts of the stalking and chase of the same noble animal will command attention from a still wider circle of readers. Whether the three chapters which Mr. Macpherson contributes to the little work before us form an adequate account of the natural history of *Cervus elaphus*, may be a moot point, but to our mind they are too "parochial." There is, for instance, nothing said as to the distribution of the red deer, or its relations to other members of the same genus; and the chief attention is directed to its breeding-habits. The author of these chapters appears to derive most of his knowledge of the animal from the Lake District; and the first chapter is nothing more than a description and history of the fells of Westmoreland, with some casual observations on red deer thrown in. It is written in a pleasant and gossipy style, but as its purport has already appeared in the pages of "Lakeland," its reproduction here seems superfluous. The third chapter in the natural history section is entitled "Echoes of the Chase," and would more appropriately have come in Lord Ebrington's section.

Indeed, the work decidedly suffers from insufficient editing. For instance, most of Lord Ebrington's very interesting remarks on antlers, in the chapter entitled "Deer," should clearly find a place in the natural history portion. Again, after Mr. Macpherson had written, on page 34, that "Deer, by the way, are very fond of nibbling the remains of shed antlers," the editor ought not to have permitted the following sentence, by Lord Ebrington, to appear on page 278.

"I have never heard any explanation that accounted for this [the rarity of the discovery of the bodies of dead deer] satisfactorily, for the hinds would not eat carrion, though there seems little doubt that they will eat both bones and shed horns."

Either the matter is, or is not, a certainty, and one allusion would suffice.

So far as we are capable of judging, the chapters on stalking and hunting form admirable and interesting accounts of these sports. In addition to the remarks on antlers already mentioned, Lord Ebrington gives us many interesting observations which might well find a place in works on natural history. In reference to the "gait" and "slot," he writes that—

"A stag's dew-claws point outward, and are large in proportion to his own size, while a hind's are small, turn inward, and point straight down. A stag crosses his legs right and left in walking, while with a hind the prints of the hind foot will be in a direct line with those of the fore foot, unless she is heavy in calf. . . . The extra weight on the legs is no doubt the reason, and at calving time the stags are defenceless too, having shed their horns. The stag moves with more confidence than the hind, so his paces are regular. The hind moves femininely and distrustfully; sometimes she will put her hind feet down in front of the spot from where she has just lifted her fore ones, sometimes on the same spot, sometimes behind it."

Unless we are greatly mistaken, there are few professed naturalists who could have given such details; and yet they are surely of much more interest than the endless multiplication of species.

The illustrations are charming works of art, and the volume must claim a place in the library of every sportsman, if not of the naturalist also.

R. L.

OUR BOOK SHELF.

The Tutorial Chemistry. Part I. *Non-Metals.* By G. H. Bailey, D.Sc., Ph.D. Pp. viii + 226. (London: W. B. Clive, 1896.)

Elementary Non-Metallic Chemistry. By S. R. Trotman, M.A. Pp. viii + 183. (London: Rivington, Percival, and Co., 1896.)

IF the publication of text-books is a sign of increased attention to the branches of science with which they deal, chemistry must be making great progress; for no week, and scarcely a day, passes without the receipt of a manual for chemical students. The two volumes now before us are fair representatives of a class of text-books designed to furnish boys with the facts which examiners periodically endeavour to entice from them.

Dr. Bailey's book furnishes a systematic outline of chemistry, so far as it relates to the non-metals. Acting upon the conviction that a knowledge of physical principles and measures should be gained from an elementary text-book of physics, Dr. Bailey has omitted the preliminary chapters usually devoted to these matters, notwithstanding the growth of opinion that experiments and measurements of physical properties of matter form the best basis for a chemical education. He does not, however, ignore the physics of chemistry altogether, for a chapter is devoted to the physical properties of gases.

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The fundamental principles of chemistry, and the nature of chemical action, are laid down in the first twenty pages of the book, after which the non-metals and some of their common compounds are described. As a companion in the laboratory, containing details of many instructive experiments, the book should find favour.

On page 8 we read: "Quite recently it has been found that Helium, one of the bodies which had already been observed in the corona of the sun, occurs in the gases extracted from certain minerals by heating them in vacuo." Helium is a constituent of the solar prominences, but not of the corona.

Mr. Trotman's book follows very much the same lines as that of Dr. Bailey; but it is more suitable for use in connection with elementary classes than for the laboratory. It is an attractive little volume, simply worded, clearly printed, and plainly illustrated. We regret to notice the absence of an index.

Hygiene for Beginners. By Ernest S. Reynolds, M.D. Pp. xiv + 235. (London: Macmillan and Co., Ltd., 1896.)

THERE are a number of good elementary books on hygiene, but this one will find a place among the best of them. The author's "Primer of Hygiene" is very well known, being widely used in Evening Continuation Schools, Technical Institutes, and County Council courses. A knowledge of elementary anatomy and physiology is, however, essential before the main principles of hygiene can be intelligently grasped. Recognising this, the author has introduced chapters on the structures and functions of the various parts of the human body, and has considerably enlarged his "Primer" in other directions. The first hundred pages of the present volume comprise nine chapters on elementary anatomy and physiology; the remaining nine chapters are devoted to that extensive and varied knowledge concerned in the prevention of disease. The book is thus thoroughly in touch with the syllabus of elementary hygiene of the Department of Science and Art. We are not given to praising books moulded to particular syllabuses, but the present volume does not slavishly follow the lines laid down by the examiner in the subject with which it deals, and the independence is a sign of the author's ability to judge for himself the best arrangement and scope of the matter. It would be to the advantage of the community if every individual had to pass an examination in the subjects dealt with; and we venture to say that every householder, and every mother having the care of children, should be acquainted with as much of the elementary principles of hygiene as is contained in this volume. As to teachers of South Kensington classes in hygiene, they only need to see the book to appreciate its admirable qualities.

The Parasitic Diseases of Poultry. By Fred. V. Theobald, M.A., F.E.S. Pp. xv + 120. (London: Gurney and Jackson, 1896.)

POULTRY are subject to many parasitic diseases, and the object of this manual is to inform poultry-keepers of the life-histories of these pests, so that means of prevention may be successfully carried out. Mr. Theobald is zoologist to the Agricultural College at Wye, while his knowledge of the characteristics and habits of the parasites he describes has been gained from observation of many diseased birds. Poultry-breeders and fanciers may, therefore, safely trust themselves to be guided by him; and they will learn from his book how to distinguish and cope with the animal and vegetable parasites which often cause them such serious loss. Entomologists will discover in the work some new points on the life-histories of the parasitic forms dealt with, as well as a list of the parasites found upon fowls.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Letters of Charles Darwin.

I AM preparing to publish a supplementary series of Charles Darwin's letters. My projected volume will include a full selection from those letters of a purely scientific interest which I was unable to print in the "Life and Letters," as well as from any fresh material that may now be entrusted to me.

I would, therefore, ask those of my father's correspondents who have not already done so to allow me to make copies of any letters of his which they possess. I venture to remind those who may be inclined to help me, that letters of apparently slight or restricted interest are often of value. FRANCIS DARWIN.

Wychfield, Cambridge, December 26.

On the Goldbach-Euler Theorem regarding Prime Numbers.

IN the published correspondence of Euler there is a note from him to Goldbach, or, the other way, from Goldbach to Euler, in which a very wonderful theorem is stated which has never been proved by Euler or any one else, which I hope I may be able to do by an entirely improved method that I have applied with perfect success to the problem of partitions and to the more general problem of demonstration, *i.e.* to determine the number of solutions in positive integers of any number of linear equations with any number of variables. In applying this method I saw that the possibility of its success depended on the theorem named being true in a stricter sense than that used by its authors, of whom Euler verified but without proving the theorem by innumerable examples. As given by him, the theorem is this: *every even number* may be broken up in one or more ways into two primes.

My stricter theorem consists in adding the words "where, if $2n$ is the given number, one of the primes will be greater than $\frac{n}{2}$, and the other less than $\frac{3n}{2}$. This theorem I have verified by innumerable examples. Such primes as these may be called mid-primes, and the other integers between 1 and $2n-1$ extreme primes in regard to the range $1, 2, 3 \ldots, 2n-1$.

I have found that with the exception of the number 10, Euler's theorem is true for the resolution of $2n$ into two *extreme* primes; but this I do not propose to consider at present, my theorem being that, with exception of $2n = 2$, every even number $2n$, may be resolved into the sum of two mid-primes of the range $(1, 2, 3 \ldots 2n-1)$. As, *ex. gr.*

$4 = 2 + 2 \quad 6 = 3 + 3 \quad 8 = 5 + 5 \quad 10 = 3 + 7$

$12 = 5 + 7 \quad 14 = 7 + 7 \quad 16 = 5 + 11$

$18 = 5 + 13 = 7 + 11 \quad 20 = 7 + 13$

$40 = 11 + 29 = 17 + 23 \quad 50 = 13 + 37 = 19 + 31$

$100 = 29 + 71 = 41 + 59$

$200 = 61 + 149 = 73 + 127 =$ &c.

$500 = 127 + 373 = 193 + 307 =$ &c.

$1000 = 257 + 743 =$ &c.

And so on.

My method of investigation is as follows. I prove that the number of ways of solving the equation $x + y = 2n$, where x and y are two mid-primes to the range $2n-1$, *i.e.* twice the number[1] of ways of breaking up $2n$ into two mid-primes + zero or unity, according as n is a composite or a prime number, is exactly equal to the coefficient of x^{2n} in the series

$$\left(\frac{1}{1-x^p} + \frac{1}{1-x^q} + \quad . \quad . \quad . \quad + \frac{1}{1-x^l}\right)^2$$

where $p, q, \quad . \quad . \quad , l$ are the mid-primes in question. This coefficient, we know *à priori*, is always a positive integer, and therefore if we can show that the coefficient in question is not zero, my theorem is proved, and as a consequence the narrower one of Goldbach and Euler. By means of my general method

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[1] This number may be shown to be of the order $\frac{n}{(\log n)^2}$ and a very fair approximate value of it is $\frac{\mu^2}{n}$ where μ is the number of mid-primes corresponding to the frangible number $2n$

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